WATER SPRING MANAGEMENT (NORTH EAST OF ALGERIA).

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Abstract:

The Tinibaouine region, located in north-eastern Algeria on the borders of the Batna-Belezma Mountains, is characterized by a semi-arid to arid climate with an average annual rainfall not exceeding 465 mm and an average annual temperature of around 22 ° C. This region is characterized by the cultivation of apricots as essential crop followed by that of olives, whose plots are all irrigated with the Tinibaouine source water. These are 450 Ha of trees for apricot and 108 Ha for olives which constitute the principal revenue of the citizens of this small village. This paper estimated the crop reference and actual evapotranspiration (Eto) respectively and the irrigation water requirement of apricot trees and olive tres. The long recorded climatic data, crop and soil data, effective water allocation and planning, the information about crop water requirements, irrigation withdrawals were computed with the Cropwat model which is based on the United Nations' Food and Agriculture Organization (FAO), the Penman-Monteith method was used to estimate ETo. Crop coefficients (Kc) from the phenomenological stages of apricot and olive were applied to adjust and estimate the actual evapotranspiration ETc through a water balance of the irrigation water requirements (IR). The results showed the BSBNR annual reference evapotranspiration (ETo) was estimated at 3.71mm/ day. The irrigation requirements were estimated at 35800m^3/ ha for apricot, 6980m^3/ ha for olive, also Irrigation needs estimated on land at 14185, 05 m^3/ ha for olive and apricot.

Keywords: Algeria,Agricultural, Economic, Irrigation, Hodna.

1. INTRODUCTION

This note concerns the determination of the water needs of the apricot crop in Tinibaouine region, located in arid climatic zone, in the North East of Algeria. The cultivation of apricots is the main natural resource exploited in this region, the olive tree being accessory, making the Tinibaouine source, from which the irrigation is done with a rate of around 100 l/s, becomes a high center of interest for a depending population of around 10.000 inhabitants.

The annual rainfall measured varies between 140 mm to 464 mm, with an average of 245 mm and the annual average of temperature is around 22 °C.

The comparison between the crops water needs estimated by Cropwat and the flows delivered by the source shows a large imbalance.

Erratic rainfall and reduced flows of the Tinibaouine source observed in recent year's raises with acuity the problem of the water management in this region.

The diminution of water loss through notably the reduction of evaporation was discussed in this note.

2. MATERIALS AND METHODS

2.1 GEOLOGY

The studied areais located in theeasternextensionof the plain Hodna, it corresponds to adepressionwedgedbetweenthe reliefs ofHodnaMountains to thenorth,ElGuetianeDjazzarin the East and DjebelEchCheffain the West.

Geological and geophysical studies have identified the existence of the following aquifers: The tank assembly Moi-Pliocene Quaternary formed by lacustrine calcareous sandstone, conglomerate and sand. The tank assembly of upper Cretaceous limestones and consists of dolomitic formations permeable because joints and cracked, waterproof wall

(hydrogeological bedrock) form by the Cenomanian marls and a semi-permeable roof (partial coverage) represented by the formations calcareous marl containing both permeable and impermeable levels (Fig 1).

The source is locatedin the village centerofTinibaouine. It emergesby a flow in Quaternary alluvial formations, in favor of aNW-SE faultthat runs alongthesouthKefRached [1]. The outflow of thesourceiscurrently (100/s).

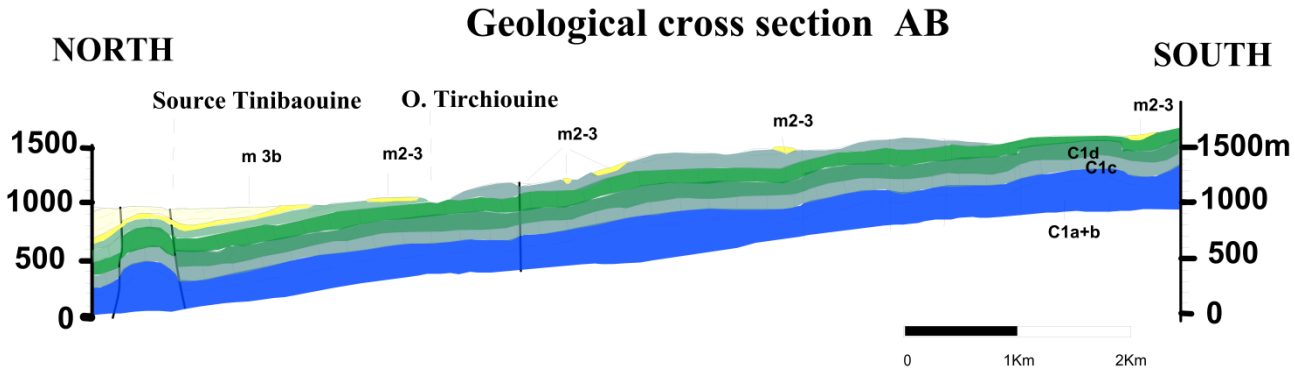

Fig.1 Geological cross section of Tinibaouine area [2]

Note: m^{2-3} :miocene, c^{5-6a} :upper Stantonian to Maastrichtian, c^{3-4} : coniacian, lower stantonian, c^{2b} :upper Turonian, c^{2a} :lower Turonian, c^{1d} :upper Cenomanian -turonian, c^{1c} : middle – upper Cenomanian, c^{1a-b} : lower Cenomanian.

2.2 HYDROCLIMATICCONTEXT

The climate issemi-arid influenced bythe humidstream of theMediterraneanseain winter andwarm and influenced by the Saharain summer. For the period 1998-2010, annual rainfall measured varies between 140 mm to 464 mm and the annualaverage of temperature (T°) isaround 22°C.Theevaporationisintenseandleads to a loss-water balance (Fig.2).

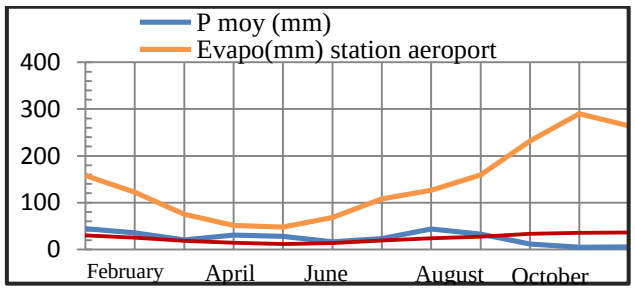

Fig.2Rainfall,T° and evaporation:1998-2010

2.4 WATER MANAGEMENT OFTINIBAOUINE SOURCE

Thewater managementsystemdistributed byseguias has required theestablishment ofan elaboratelegal and technical framework[3]. This former supply and distribution system was known to the Romans who surrounded it by constructs to use its pure and clear water.WaterUnits of irrigation(calledNouba) are calculated for all the ownersaccording to theareas to be irrigated. This distributionis registered andregulated byan official act.Theshindigis plannedona definiteperiod andincreases each timewe move away fromthe source (6, 21 and 30 days).The source flow is shared with a diverter in 05 major seguias whose distribution is reported in.

3. DETERMINATION OF THE WATERNEEDS

Thewater needs of theapricot and olivecrops will be determined bythe use ofCropwat (in its free version) thatisirrigationmanagementsupport softwaredevelopedby FAOin 1992. It is based onthe evaporation formula ofPenman-Monteithmodified. It offers the opportunity to develop an irrigation schedule based on various agricultural practices and it permits to assess the effects of lack of water on crops and efficiency of different irrigation practices.

4. RESULTS AND DISCUSSION

The water needs calculated by Cropwat for apricot and olive crops are presented in figures 3.

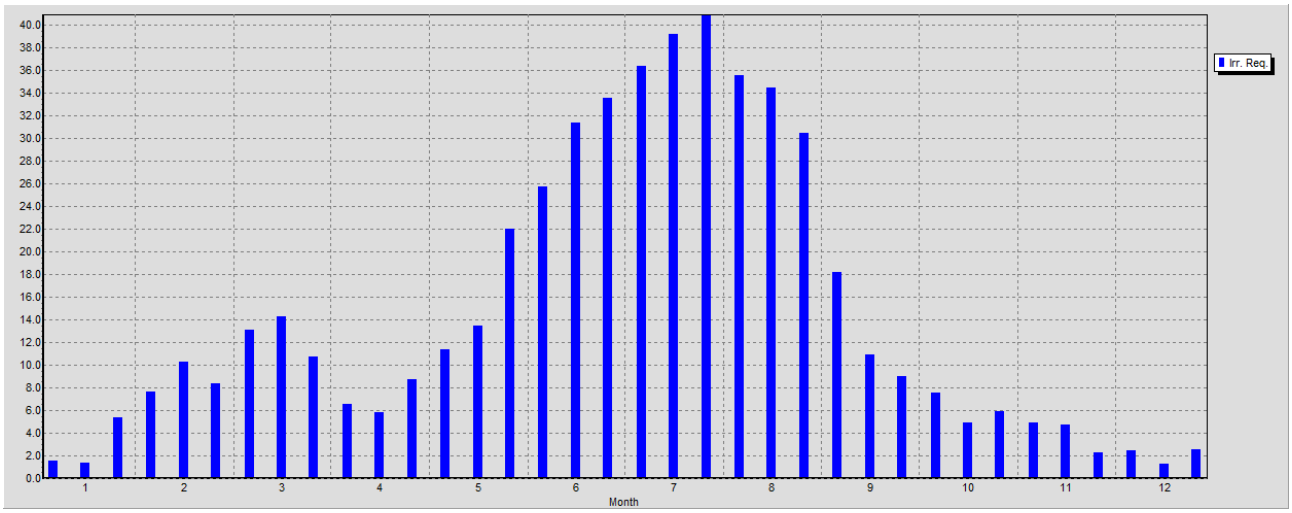

Fig. 3Crops water needs (mm/dec) apricot

It appears that water needs of olive trees grew in the period June to August, this is mainly due to the increase of the crop coefficient during the foliage stage , which is the summer season which also corresponds to the Eto highest period [4]-[5]-[6] [7]-[8]

5. CONCLUSION

In our work, we have tried to estimate olives' and apricots' needs of water in the region of Tinibaouine, which is located in an arid area, with a yearly rainfall of around 250 mm.

The comparison of the real irrigation needs' doses calculated by CROPWAT showed huge water deficiency that significantly makes the development of the agricultural lands slows.

Nevertheless, the use of dripping irrigation system and replacing seguias by solid HDPE pipe allows a relative water field saving.

The surveys which we have conducted showed that farmers are unaware of their crops and the needed doses of water. The experienced irrigation line is most often based on traditional tools.

The measures we have taken allowed us to have a magnitude order on the amount of water that can bring the farmer to apricot and olive trees.

The average total volume that must be mobilized to cover the irrigation needs of these crops is 12086, 04 m^3/ha of water for 124 hectares.

Finally, we must be aware that the rational management of water has concrete implication, particularly the social-economic viability. It will be achievable if all parties work together.

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